DOCUMENT RESUME

ED 282 767 SE 048 193

AUTHOR Hamm, Mary; Adams, Dennis
TITLE An Analysis of Global Problems Issues in Sixth and Seventh Grade Science Textbooks.
PUB DATE Apr 87
NOTE 15p.; Paper presented at the Annual Conference of the American Educational Research Association (Washington, DC, April 20-24, 1987).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Content Analysis; Controversial Issues (Course Content); Elementary Education; *Elementary School Science; *Global Approach; Grade 6; Grade 7; Middle Schools; *Science and Society; Science Education; Science Instruction; *Textbook Content; Textbooks; *World Problems
IDENTIFIERS *Science Education Research

ABSTRACT

The study examines the extent to which the global issues of population growth, world hunger, air quality and atmosphere, and water resources were treated in sixth and seventh grade science textbooks. Ten textbooks were examined by five raters to determine the amount of content presented by different textbooks on global issues, the number of pages of content devoted to each issue and the degree of depth in which issues were treated. Differences between grade levels were also explored. Of the 4,393 pages of content analyzed, less than 2% was devoted to those issues identified as the most serious human problems. No significant differences were found between textbook series. Significant differences were found in the number of pages of content presented on each issue. Most of the content fell into the categories of water resources, population growth, air quality and atmosphere. The issue of war technology had the least amount of content. Distribution of content did not vary by grade level. Books at both grade levels addressed the issues of population growth, air quality and water resources with a greater degree of depth than the issue of world hunger or war technology. The study concludes that the most widely used textbooks at the sixth and seventh grade levels avoid serious discussion of major global problems. Perspectives are offered on the need for textbooks to reflect current global issues and concerns. (Author/ML)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED282767

An Analysis of Global Problems Issues In Sixth and Seventh Grade Science Textbooks

Dr. Mary Hamm
Department of Educational
Theory & Practice
The Ohio State University

Dr. Dennis Adams
Department of Curriculum & Teaching
Hofstra University
Hempstead, New York

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Mary Hamm

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE 048 193

An Analysis of Global Problems Issues
In Sixth and Seventh Grade Science Textbooks

Abstract

The study examines the extent to which the global issues of population growth, world hunger, air quality and atmosphere, and water resources were treated in sixth and seventh grade science textbooks. Ten textbooks were examined by five raters to determine the amount of content presented by different textbooks on global issues, the number of pages of content devoted to each issue and the degree of depth in which issues were treated. Differences between grade levels were also explored.

Of the 4,393 pages of content analyzed, less than 2% was devoted to these issues identified as the most serious human problems. No significant diffrences were found between textbook series. Significant differences were found in the number of pages of content presented on each issue. Most of the content fell into the categories of water resources, population growth, air quality and atmosphere. The issue of war technology had the least amount of content. Distribution of content did not vary by grade level. Both levels addressed the issues of population growth, air quality and water resources with a greater degree of depth than the issue of world hunger or war technology.

The study concludes that the most widely used textbooks at the sixth and seventh grade levels avoid serious discussion of major global problems. And like the career indecision of a recent Miss America contestant, purchasers don't seem to be able to decide whether they want science textbooks to be "a brain surgeon or a movie actress". Implications stemming from this dichotomy and its relationship to future science education curricula are also explored.

Introduction

Textbook publishers frequently push aside "sensitive" issues as they reach for larger markets. At the same time the world is experiencing a scientific and technological crisis so unprecedented (and sensitive) that many do not even know that is is taking place. Given the current dependency on textbooks, schools and publishers are locked in a symbiotic relationship.

The status of science education has been the focus of much national attention in this decade. Critics cite a declining student interest in science (Weiss, 1978), the scant attention paid to personal and social issues (Hurd, Kahle, & Yager, 1983), and the omission of interdisciplinary technological, social and scientific concerns (Dede & Hardin, 1973) as failures of science education in a technological age. The implication here is that students should be provided with direct decision-making experiences that focus on science technology and society. Instead science for the majority of the population is the relatively uninspired information contained in standard textbooks. Everyone but teachers and students have placed demands on the publishers.

Today's definition of success in elementary and middle school science is usually defined as mastery of the textbook. Recent studies show over 90 percent of all science teachers use a textbook 95 percent of the time (Harms, Yager,1980;Yager,1983). Whether we like it or not, textbooks provide the hub around which much of the curriculum turns.

To what extent are textbooks attractive transmitters of key concepts in science? Studies by the National Science Foundation report a virtual lack of scientific and technological literacy among American students (NSF, 1982) and a presidential commission identified the science education of the majority of American students as a serious problem (NSF and Department of Education, 1980). Students exhibited high degrees of misunderstanding about science concepts and the application of those concepts (NSF, 1982). At the same time science and technology are becoming increasingly important in the lives of ordinary citizens.

In the midst of the debate, teaching science from a Science-Society Technology (STS) prospective has emerged as a new conceptual framework

for science education. STS focuses attention on the impact of science and technology and its relationship to society. It emphasizes a problem solving approach proceeding from problem identification to problem resolution. For the average individual awareness of the social, moral and ethical implications of science are crucial to understanding the role of science and technology in a complex world society. Dealing with societal issues and approaching science with a broad awareness of the personal and social dimensions helps students connect the abstract scientific knowledge to their own personal-social needs and concerns.

The approach of this study was to examine science textbooks concerning one aspect of the STS theme; global problems related to science and technology. Sixth and seventh grade textbooks were examined for their treatment of five top ranked global problem issues. The study focused on the extent to which textbooks addressed the issues, the differences between the amount of content devoted to each issue per text and per grade level, and the degree of depth in which issues were presented.

Method

The global issues chosen for this study were based on data collected from national and international surveys of scientists, engineers and science educators considered experts in their fields (Bybee, 1985; Bybee & Mau, 1986). Nearly 400 scientists from over 40 countries identified population growth, world hunger, war technology, water resources, and air quality and atmosphere as the most serious problems facing the planet. There was a consensus that these science and technology related global problems would be worse by the year 2000.

To determine the sixth and seventh grade science textbook series in greatest use a search was made of related periodicals and research studies. University experts were contacted as well as the California State Department of Public Instruction who had just finished a textbook project in science education. Based on these findings ten textbooks were chosen (table 1). These texts represent over 90% of all sixth and seventh grade textbook sales in 1986 (California Department of Education, 1986).

Table 1
Sixth and Seventh Grade Textbooks Used In Study

Silver Burdett Science, Silver Burdette Co., 1985 -Grade 6
HBJ Science,HBJ Science, Harcourt, Brace, Jovanovich, 1985 -Grade 6
Holt Science, Holt, Rinehart & Winston, 1986 -Grade 6
Accent On Science, Charles E. Merrill, 1985 -Grade 6
Science, Scott Foresman, 1986 -Grade 6
General Science, Silver Burdette Co., 1984 -Grade 7
Principles of Science, Charles E. Merrill, 1985 -Grade 7
Holt Life Science,Holt, Rinehart & Winston, 1982 -Grade 7
Life Science, Scott Foresman, 1986, -Grade 7
Life Science, Macmillan, 1986 -Grade 7

The sixth grade level was selected because it is the end book of a kindergarten through six series. If issues were treated by elementary texts it was felt that sixth grade textbooks would reflect this treatment in the most depth. Seventh grade texts were chosen so that a two year consecutive comparison could be made. They were also selected because different authors are responsible for seventh grade texts than K-6 series.

Independent coders were trained in using a rating instrument developed by the investigators.

Analysis of Data

A content analysis of the 4,393 pages in ten 6th and 7th grade textbooks indicated that 80.5 pages or 1.8% of the content addressed the global issues of population growth, world hunger, war technology, air quality and water resources. [38.5 pages were found in 6th grade textbooks, and 42 pages of content in 7th grade texts.]

Textbook series were examined in head to head comparisons at each grade level. The chi-square test revealed statistical differences only between Merrill and Holt textbooks at the sixth grade level. These differences were largely due to the distribution of the number of pages of content among categories. No statistical differences were found between any of the other textbook series compared.

In an analysis by category it was found that nearly all global issues addressed at the sixth and seventh grade levels fell into the categories of population growth (30.1% or 24.25 pages), air quality (29.2% or 23.5 pages) and water resources (33.2% or 26.75 pages). The categories of war technology and world hunger together accounted for less than 8% or 6 pages [table 2].

Significant differences were found at both the sixth and seventh grade levels among the category issues [tables 3,4]. However, when sixth grade textbooks were compared with seventh grade texts by category the chi-square test of association showed no significant differences[table 5]. Both levels gave approximately the same treatment to individual issues. Coders reported very little difference not only in the amount of pages of content in each category, but in the content itself; the same examples were even used across grade levels in many instances.

Table 2
Percentage of Pages with Global Problems Content for Each Textbook

Textbook	N	T	%t	%g
Holt 6	18	407	4.4	46.8
Silver Burdett 6	.75	379	.2	1.9
Scott Foresman 6	2.25	394	.6	5.8
Merrill 6	16	389	4.1	41.6
HBJ 6	1.5	390	.4	3.9
Holt 7	8.5	478	1.8	20.2
Silver Burdett 7	3.75	474	.87	8.9
Scott Foresman 7	10.25	478	2.1	24.4
Merrill 7	12.5	512	2.4	29.8
Macmillan 7	7	492	1.4	16.7
All Textbooks	80.5	4393	1.8	
6th Grade Texts	38.5	1959	1.96*	
7th Grade Texts	42	2434	1.72*	

N-number of pages of global issues content
T-number of pages in the textbook(s)
%t-percent of the pages in the text with global issues content
%g-percent of issues content compared to other textbooks for that grade
*percent of all issues content presented in 6th and 7th grade textbooks

Table 3
Pages of Content by Category for 6th Grade Texts

Catagory	Total Pages in Texts	f expected
Population	11.5	7.7
War Technology	0.5	7.7
World Hunger	3	7.7
Air Quality	11	7.7
Water Resources	12.5	7.7

Total number of pages for all categories=38.5
$x^2(4, N=5)=15.88$, $p< .05$+, $p<.01$++

Table 4
Pages Of Content by Category for 7th Grade Texts

Category	Total Pages In Texts	f expected
Population	12.75	8.4
War Technology	0	8.4
World Hunger	2.5	8.4
Air Quality	12.5	8.4
Water Resources	14.25	8.4

Total number of pages for all categories=42.0
$x^2(4, N=5)=20.86$, $p<.05$+, $p<.01$++

Table 5
Pages of Content By Category According To Grade Level

Grade	Population	Hunger	War Tech.	Air Quality	Water Resources
Sixth	11.5	3	.5	11.5	12.5
Seventh	12.75	2.5	0	12.5	14.25

$x^2(4, N=5)=.669$, $p>.05$

Textbooks were rated on a four point scale (0-3) as to the degree of depth in which issues were treated. The Kruskal-Wallis non-parametric test was used to test for differences in the way each issue was treated. Significant differences were found among sixth grade textbook series in their treatment of all of the issues. Holt and Merrill texts received the highest average rating over all categories. [A graphic representation of this data is shown in table 6, Appendix A]

At the seventh grade level significant differences were found concerning the degree of depth in which they treated air quality and water resources. The issue of war technology was not treated at all by the seventh grade textbooks examined [table 7, Appendix A].

Again, there were no significant differences between grade levels as to the degree of depth at which each issue was treated.

Summary, Implications

Pedagogical dependency on textbooks is clear. So is their lack of intellectual depth on most global issues. This study finds that less than two percent of the contents of sixth and seventh grade science textbooks deal with serious global issues. [Percentages range from .2 to 4.4 percent of the total text]. There is little difference between either textbook series or designated grade level in the number of pages devoted to the issues of world population, war technology, world hunger, air quality and water resources. The textbooks analyzed only superficially addressed the issues of population growth and world hunger and did not address the issue of war technology. The Strategic Defense Iniative ("Star Wars") may be directing American science for the next decade--but you will find no mention of it in textbooks.

In 1982 the National Science Teachers Association recommended that science curriculums begin to examine societal issues that have a scientific and technological basis (NSTA, 1982). With accumulating evidence that the science textbook ends up being the primary curriculum for science (Stake & Easley, 1978, Yager, 1983), NSTA correctly assumes science curriculums are still at the very beginning stages connecting major issues and science concepts. The conclusions drawn from this study support the NSTA's position and show emperically how textbooks avoid important social consequences of science. The implications are that professional educators (teachers) must provide informed leadership in deciding textbook quality--and how the curriculum can move beyond the current levels of educational dependency.

There is a need to explore how these issues can be brought into both textbooks and the curriculum with intellectual rigor. There is a definite need to investigate the relationship between teaching global problems

issues and the formation of children's attitudes about these problems. This includes a more thorough understanding of the characteristics of effective instruction.

It usually takes three to five years to prepare a new science textbook series for publication. Overzealous censorship efforts by narrow interests can be avoided while listening to the consumers of these curriculum materials--namely students and teachers. By combining high levels of teacher competency with the time and evaluation training, educators can make informed decisions that help direct publishers.

Textbooks devoted more pages to issues of world population, air quality and water resources. War technology was not dealt with at either level, and the issue of world hunger received little or no attention. Issues that received little treatment in sixth grade, received little attention at the seventh grade level. In spite of claims to both "intellectual rigor" and "motivational value" coverage of key areas are dependent on the ingenuity of individual teachers. If the teacher doesn't provide the knowledge then key areas of science education are the sole province of broadcast television.

Textbooks play a major role in influencing both <u>how</u> and <u>what</u> a child learns in school. Therefore they must be viewed as key elements in school reform. The TV set should not be the sole souce of information on vital issues. No matter how controversial, it is important that textbooks reflect current global issues and concerns. Studying about these concerns not only provides children with a problem solving background in science concepts, but helps them gain the level of scientific literacy so crucial to being an informed citizen in our technologically intensive future. Changing our schools for the better will require attention to those who work in the schools <u>and</u> those who provide the curriculum resources.

References

Bybee, R. (1985). The Restoration of Confidence in Science and Technology Education. School Science and Mathematics, 85(2).

Bybee, R. & Mau, T.(1986). Science and Technology Related Global Problems: International Survey of Science Educators. Journal of Research In Science Teaching, 23(7), 619-634.

California Department of Education. (1986). Published Proceedings On Textbook Selection, Science Education.

Hurd, P., Bybee, R., Kahle, J., & Yager, R. (1983). Biology Education in Secondary Schools of the United States. American Biology Teacher, 42(7), 388-410.

National Science Board. (1982). National Science Foundation Study. Washington, D.C: U.S. Government Publications.

National Science Foundation and Department of Education. (1980). Science and Engineering Education for the 1980s and Beyond. U.S. Government Printing Office.

National Science Teachers Association. (1982). NSTA Position Statement On School Science Education for the 1980s. Washington, D.C.:NSTA.

Stake, R. & Easley, J., et. al. (1978). Case Studies in Science Education. Urbana: University of Illinois, Center for Instructional Research and Curriculum Evaluation.

Weiss, I. (1978). Report of the 1977 National Survey of Science, Mathematics, and Social Science Education. Washington, D.C.: U.S. Government Printing Office.

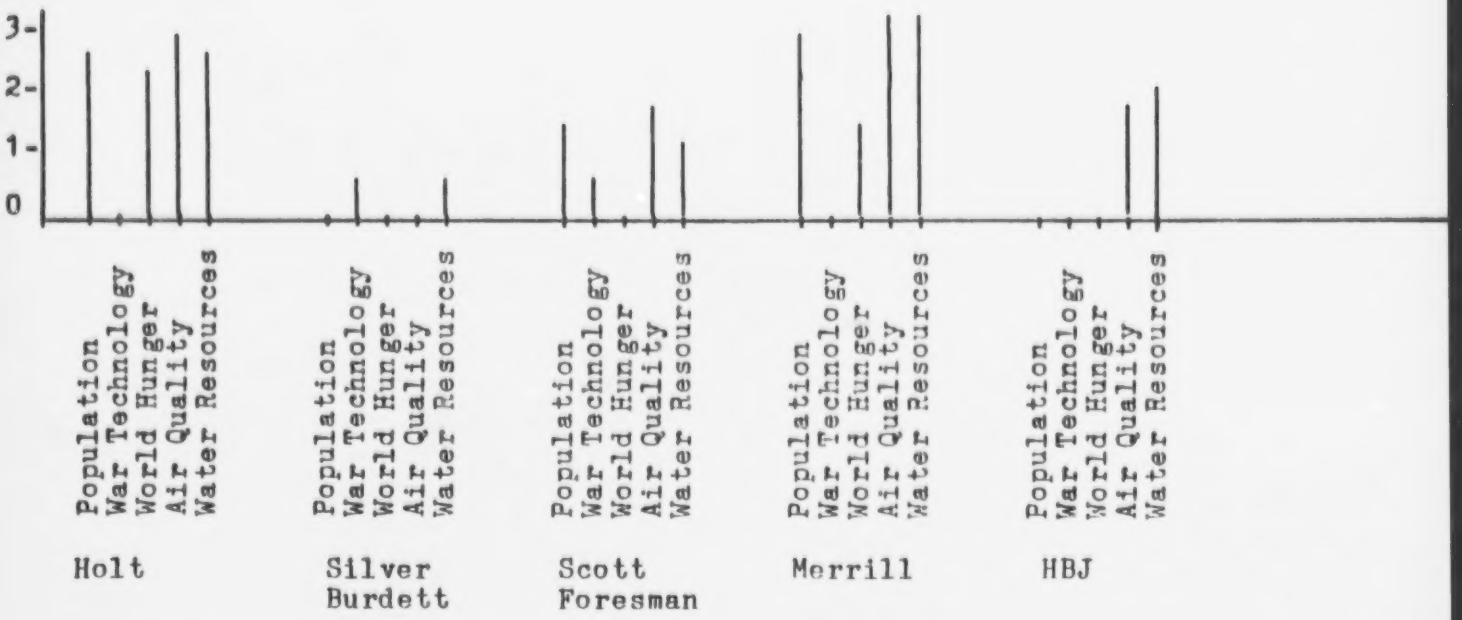
Yager, R. (1980). Crisis In Science Education. Technical Report #21, The University of Iowa, Science Education Center.

Yager, R. (1983). In Defense Of Societal Issues as Orgganizers for School Science. School Science and Mathematics, 83(3),651-653.

Appendix A

Table 6

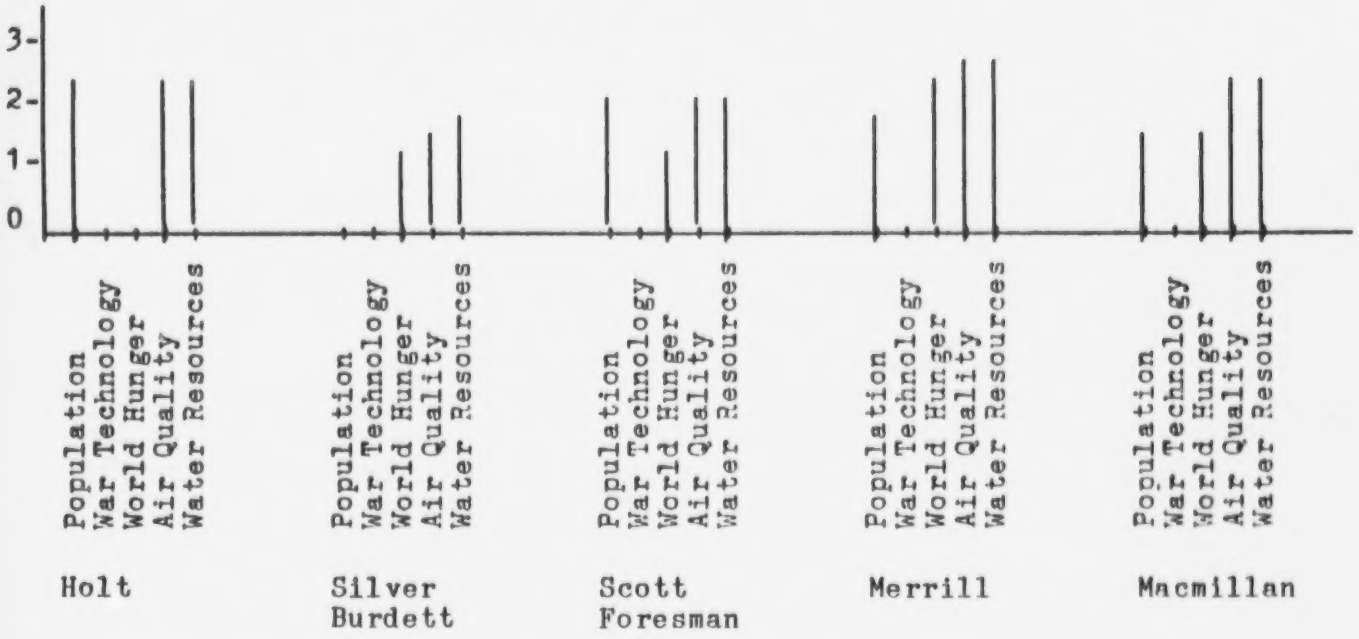
Degree of Depth In Which Global Issues Were Addressed In Sixth Grade Textbooks



0= not mentioned, 1=awareness level, 2=some depth (comprehension level)
3= great depth (application, analysis, synthesis, evaluation levels)

Table 7

Degree of Depth In Which Global Issues Are Addressed In Seventh Grade Textbooks



0=not mentioned, 1=awareness level, 2=some depth (comprehension level)
3=great depth (application, analysis, synthesis, evaluation levels)